

REMARKS / ARGUMENTS

Claims 22-43 remain pending in this application. No claims have been canceled or added.

35 U.S.C. §103

Claims 22-23, 28-34 and 39-43 stand rejected under 35 U.S.C. §103(a) as being unpatentable over DeKoning et al (U.S. Patent No. 5,790,773) in view of Sicola et al (U.S. Patent No. 6,643,795). These rejections are traversed as follows.

As mentioned in the previously filed response, according to the present invention, a storage system includes a plurality of disk drives including first disks configuring a RAID group and at least one second disk not initially in the RAID group. Each of the first disks stores one of data or parity data. The second disk is able to be used as a spare disk for replacing one of the first disks in case of impending failure of one of the first disks. When one of the first disks starts to fail, this is detected because the error status matches a predetermined first criterion. When this occurs, the storage system starts to copy (mirror) data from the failing first disk to the second (spare) disk. However, if another one of the first disks shows a more severe risk of failure, the storage system stops the copying of data from the original first disk to the second disk, and instead starts to copy data from the other first disk to the second disk. This enables the storage system to copy data from the disk most likely

to fail to the second disk, and replace the disk most likely to fail in the RAID group with the second disk so that the RAID group is maintained and stoppage of the storage system can be avoided.

It is submitted that the newly cited references fail to render the presently claimed invention unpatentable. DeKoning et al disclose generating a snapshot copy of data in a RAID storage subsystem in response to a snapshot request from a host computer (see Figs. 2 and 3). In Fig. 3, element 300 is directed to the configuring of spares to serve as a replacement mirror component (see column 6, lines 26-35). The replacement mirror component is necessary to replace a non-operational mirror component. In other words, in response to the snapshot request, an operational mirror component is created and data is copied. This snapshot copy is generated and returned to the host computer for use for archival backup or other purposes (see column 7, lines 25-28). DeKoning et al are silent with respect to mirroring data between disks based upon an error status of a disk as claimed. In other words, DeKoning et al do not disclose or suggest using a spare disk dynamically based upon errors detected in other disks.

The deficiencies in DeKoning et al are not overcome by resort to Sicola et al. The Examiner refers to column 4, line 44 to column 5, line 8 of Sicola et al as allegedly disclosing the mirroring of data based upon the error status as claimed. However, neither this nor any other portion of Sicola et al support the Examiner's position. Sicola et al disclose that device failures, such as controller and link failures,

are detected by “heartbeat” monitoring by each array controller (see column 4, lines 44-49). If a failure occurs in one link, that array controller will automatically “failover”, or move the base of data replication operations to its partner controller (see column 4, lines 54-59). Therefore, Sicola et al also do not disclose or suggest the starting and stopping of mirroring of data between disks based on an error status of a disk. Furthermore, as with Dekoning et al, Sicola et al do not disclose or suggest using a spare disk dynamically based upon errors detected in other disks.

The Examiner’s attention is directed to Fig. 3 which shows redundant links 223A and 223B and redundant array controllers 201/202 and 211/212. Sicola et al merely disclose that if there is a failure on link 223A, then link 223B would still be available for transmission of data (see also Fig. 9 and column 14, lines 19-39).

Therefore, Sicola et al cannot be combined with DeKoning et al to arrive at the presently claimed invention. DeKoning et al disclose the creation of a mirror copy upon receiving a snapshot request. Sicola et al disclose providing redundant links and controllers. Therefore, assuming that the teaching of these references could be combined, such combination would not disclose or suggest mirroring data between one of a plurality of first disks to at least one second disk based upon an error status of the one of the first disks. Furthermore, such combination would also not disclose or suggest stopping mirroring data between one of the first disks and the at least one second disk and starting to mirror data between another one of the first disks and the

Appl. No. 10/775,702
Response dated February 9, 2007
Reply to Office Action of December 4, 2006

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at least one second disk according to an error status of the one of the first disks and the another one of the first disks as claimed.

Request for Interview

Applicants request that the Examiner conduct an interview with the undersigned in order to expedite prosecution of this application. In this regard, the Examiner is hereby invited to contact the undersigned by telephone to arrange an appropriate date and time for such interview.

Conclusion

In view of the foregoing, Applicant respectfully requests that a timely Notice of Allowance be issued in this case.

Respectfully submitted,

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